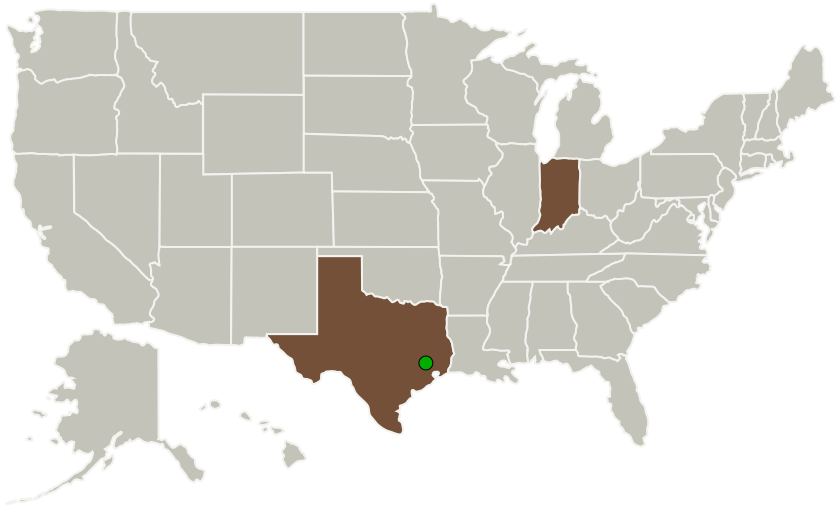
Snap Freezer for ISS, Phase II

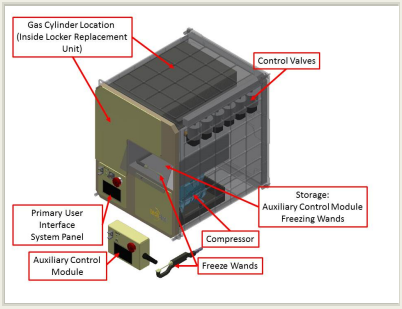
Completed Technology Project (2016 - 2017)

Project Introduction

Frozen tissue samples represent the state of the art in tissue preservation in many molecular analysis techniques as well as in in membrane analysis using free-fracture techniques. Rapid freezing eliminates the artifact caused by ice crystal formation within the tissues. Ice crystal nucleation and growth occurs between 0?C and -20?C typically. To avoid this damage and minimize destruction of proteins, RNA and DNA by lytic enzymes, cells or tissues have to be rapidly cooled through this temperature band. This is typically done in an isopentane bath cooled by liquid nitrogen (LN2) to -150?C. This 2 step process eliminates artifacts caused by ice nucleation as well as artifacts caused by nitrogen bubbles that surround the tissue as it boils if submerged directly into LN2. While these open methods are acceptable for terrestrial laboratories, they would not be compatible with experimentation on the International Space Station. Our proposed gaseous nitrogen-based Rapid Freezer clamp would provide an alternative means to rapid cool through ice crystal nucleation and growth temperatures without exposing the crew to the spill hazards of LN2 and chilled isopentane as well as the extreme flammability of isopentane.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Techshot, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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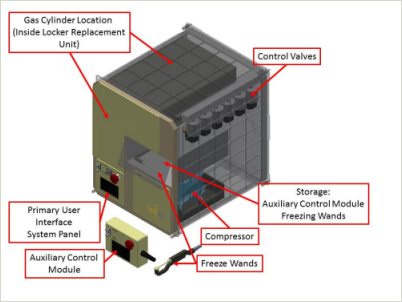
Organizations Performing Work	Role	Type	Location
Techshot, Inc.	Lead Organization	Industry	Greenville, Indiana
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Indiana	Texas

Images



Briefing Chart Image
Snap Freezer for ISS, Phase II
(https://techport.nasa.gov/image/135832)

Project Management

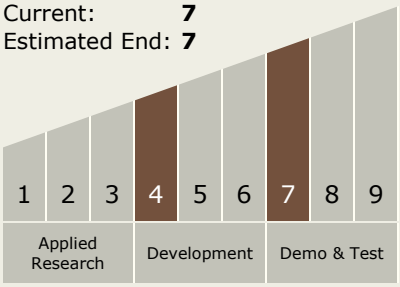
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Co-Investigator:
Eugene D Boland

Technology Maturity (TRL)

Start: **4**
Current: **7**
Estimated End: **7**



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.3 Human Health and Performance
    - TX06.3.6 Long Duration Health

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Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System